

SCIENTIFIC ARTICLE

Sleep patterns and insomnia among portuguese adolescents: a cross-sectional study

Odete Amaral^{a,*}, António Garrido^b, Carlos Pereira^a, Nélío Veiga^a, Carla Serpa^c, Constantino Sakellarides^c

^aEscola Superior de Saúde de Viseu, CI&DETS, Instituto Politécnico de Viseu, Viseu, Portugal

^bCentro Hospitalar Tondela-Viseu, Viseu, Portugal

^cEscola Nacional de Saúde Pública, Universidade Nova de Lisboa, Lisboa, Portugal

KEYWORDS

Sleep patterns;
Insomnia;
Daytime sleepiness;
Adolescents;
Epidemiology

Abstract

Introduction: Inadequate sleep patterns and insomnia are frequently linked and represent common sleep disorders among adolescents. The present study provides data on sleep patterns and insomnia among Portuguese adolescents.

Material e methods: In a cross-sectional study we evaluated 6,919 students from the 7th to the 12th grade from twenty-six secondary schools. Data was collected using a self-administered questionnaire. Insomnia was defined based on the Diagnostic and Statistical Manual of Mental Disorders IV criteria and daytime sleepiness was assessed with the Epworth Sleepiness Scale. Sleep patterns evaluated both sleep duration ("insufficient" sleep was defined as < 8 hours per night) and bedtime schedules and regularity.

Results: The prevalence of insomnia was 8.3%, insomnia symptoms 21.4% and insufficient sleep 29.3%. All prevalence were higher among girls ($P < .001$). Average sleep time, on weeknights, was $8:04 \pm 1:13$ hours. On average adolescents went to bed at $22:18 \pm 1:47$ hours, took 21 minutes to fall asleep and woke up at $7:15 \pm 0:35$ hours. Only 6.4% of adolescents stated having a regular bedtime. The majority of adolescents (90.6%) reported having difficulty waking up, 64.7% experienced daytime sleepiness and 53.3% experienced sleep during classes.

Conclusions: There are high prevalence of inadequate sleep patterns, insufficient sleep and insomnia among Portuguese adolescents. Insufficient sleep is associated with sleep patterns and social and behavioural factors. These results add to our knowledge of adolescent sleep worldwide.

© 2014 Elsevier España, S.L. All rights reserved.

*Corresponding author.

E-mail: mopamaral@gmail.com (O. Amaral).

Introduction

Sleep disorders encompassing insomnia and symptoms of insomnia, insufficient sleep and inadequate sleep patterns, and delayed sleep phase syndrome are frequent throughout adolescence. All changes at play in this stage of development lead to an increased sleep onset latency,¹ more nocturnal awakenings and a progressive delay in sleep phase resulting in shortened sleep length and increased daytime sleepiness.² Insomnia is regarded as the prevailing sleep disorder among adolescents and 4.4% to 13.4% of adolescents suffer from insomnia.³ The National Institutes of Health have stated that adolescents and young adults (aged 12 to 25) are the population at higher risk of excessive daytime sleepiness.⁴

Inadequate sleep patterns among adolescents are another frequent and present-day problem, especially insufficient sleep patterns (short sleep length) and irregular sleep patterns (not going to bed or waking up at the same time and substantial asymmetries between week and weekend nights).⁵⁻⁷ This last routine is characterized by staying up late and waking up early on week nights (school days) and attempting to “recover” sleep (by waking up later) during the weekends.⁸ Among older adolescents, as bedtime moves to later hours of the night whilst waking up remains early due to school timetables, the percentage of adolescents with insufficient and irregular sleep and with excessive daytime sleepiness increases. A study done with Australian adolescents aged 13 to 18 showed that they slept an average 8 h 17 min on school nights, with bedtime 10:28 pm and wake time 07:10 am; older adolescents referred going to bed later and shorter sleep durations.⁶ The same study reported that only one in eight adolescents experienced regular spontaneous awakenings on school mornings, with over three quarters needing help from either parents or alarm clocks to wake them.⁶

Scientific evidence on the fact that adolescents sleep less than recommended is piling up.^{7,9-11} A systematic review of the literature –*Never Enough Sleep: A Brief History of Sleep Recommendations for Children*– shows that recommended sleep for the different age groups diminished at an average rate of –0.71 minutes per year.⁹ Meaningfully this decline was identical to the actual decay in sleep length (–0.73 minutes per year).⁹ Some studies have suggested that adolescents need 9-9.5 hours of sleep each night.^{12,13} Accordingly, others studies with adolescents have considered a sleep duration of less than 8 h as “insufficient sleep”, 8-8.9 hours as “acceptable sleep” and ≥ 9 h as “adequate sleep”.^{14,15} The *National Sleep Foundation* (2000) refers that “Adolescents require at least as much sleep as they did as pre-adolescents (in general, 8.5 to 9.25 hours each night)”.¹⁶

Besides school related activities, social life and entertainment practices (nightlife, staying out late, watching TV/ listening to music at night, using “new technologies”) pubertal physiological changes also play a role on sleep schedules delaying the “biological clock”, shifting adolescents towards eveningness and making it more difficult for them to fall asleep earlier. Few studies have examined sleep patterns of Portuguese adolescents as well as insomnia. The objectives of this study were to describe sleep patterns and to determine the prevalence of insomnia and daytime sleepiness among Portuguese adolescents.

Material and methods

In a cross-sectional study we evaluated a sample composed of students from 26 public secondary schools, chosen using convenience and random criteria. Data gathering was done using a self-applied questionnaire answered by the students in the classroom. Of 9.237 questionnaires distributed, we collected 7.581 (82.1%). We excluded from analysis all questionnaires from adolescents younger than 12 or older than 18 years of age (211) and unfilled forms (451). Data from a total of 6.919 questionnaires were analysed.

The questionnaire was composed of a brief introduction, followed by sets of questions aiming at socio-demographic characterization and evaluation of sleep patterns, insomnia and daytime sleepiness. To characterize sleep patterns there were questions regarding sleep duration on weeknights (bedtime and wake up time, average sleep length per night), the constancy of sleep habits, sleep onset latency and the custom of taking naps. Sleep duration was self-reported through the question: “On average, how many hours do you sleep each night?”. A sleep length of at least 9 h (≥ 9 hours) per night was considered “adequate sleep”, between 8 and 9 hours was considered “acceptable sleep” and < 8 hours “insufficient sleep”. Insomnia was assessed based on the presence of insomnia symptoms as defined by the Diagnostic and Statistical Manual of Mental Disorders IV criteria (difficulty in falling asleep, or frequent arousals with difficulty getting back to sleep, or early morning awakening and not being able to fall asleep again, or non-restoring sleep; these items refer to the previous month and with a frequency of at least three times per week) associated with daytime impairment. Daytime sleepiness was assessed with the Epworth Sleepiness Scale¹⁷ validated for the Portuguese population,¹⁸ and it was considered that the adolescent presented daytime sleepiness for scores above 10.

The overall sample consisted of 6919 adolescents, in which 3668 (53.2 %) were of the female gender. The largest percentage of adolescents was 16 years old (19.1 %) and attended the tenth grade (19.8 %). Most parents (45.4 %) had a 7th to 12th grade education, and a large majority was married/common law marriage (83.9 %). In regard to residence area, 63.6 % of adolescents lived in a village.

The analysis and processing of data were done using the Statistical Package for the Social Sciences version 20 (SPSS 20). Prevalence was expressed in percentages, with the respective 95% confidence interval (CI 95 %). To compare continuous variables, regardless of the nature of distribution, we used the Kruskal-Wallis and Mann-Whitney tests. To compare proportions we used *Qui-square* independency test.

Results

The prevalence of insomnia in the whole sample was 8.3% and the prevalence of insomnia symptoms was 21.4%. The prevalence of insomnia was superior in females (10.1% vs. 5.9%; $P < .001$) as was the prevalence of symptoms of insomnia (25.6% vs. 15.8%; $P < .001$). The prevalence of daytime sleepiness was 33.1%, with a superior risk in the female sex (OR = 1.40; CI95%, 1.27-1.55). The prevalence of

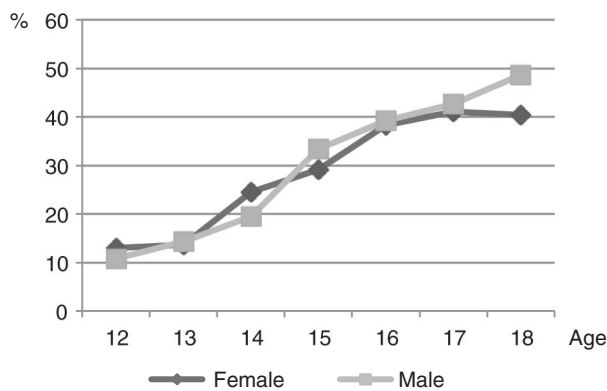


Figure 1 Prevalence of insufficient sleep according to sex and age.

insufficient sleep (< 8 h) was 29.3%, acceptable sleep 40.4% and adequate sleep 30.3%. Sleep duration was significantly shorter when adolescents presented insomnia symptoms ($7:27 \pm 1:25$ vs. $8:01 \pm 1:07$; $P < 0.001$). For both genders there was an increase in the prevalence of insufficient sleep with increasing age (Fig. 1).

On average adolescents mentioned going to bed at $22:18 \pm 1:47$ hours and getting up at $7:15 \pm 0:35$ hours. The median sleep length indicated was $8:04 \pm 1:13$ hours on weeknights. Gender differences were statistically significant ($P < .001$) for bedtime and wake up time and girls stated going to bed later and waking up earlier.

Regarding sleep patterns constancy only 6.4% of adolescents declared going to bed at the same hour every night. A percentage of 33.9% stated going to bed at the same hour almost every night and 38.3% mentioned sometimes going to bed at the same hour. As much as 14.4% stated hardly ever going to bed at the same hour and 7.0% of adolescents declared never going to bed at the same hour. Sleep onset latency was ≥ 30 minutes for 31.6% of adolescents while the remaining adolescents took less than 30 minutes to fall asleep.

On the subject of taking naps 76.8% of adolescents mentioned never doing it; 16.5% seldom took naps; 6.1% of adolescents took naps almost every day and 0.6% declared taking naps every day.

A majority of adolescents experienced difficulty getting up in the morning: 22.4% “every day”, 20% “almost every day”, 33.8% “sometimes” and 14.4% “rarely”. Similarly, 75.7% of adolescents referred waking up tired, predominantly girls (80.8% vs. 70.1%; $P < .001$).

When questioned about daytime sleepiness most adolescents replied positive (64.7%) and this was superior among girls (71.9% vs. 56.7%; $P < .001$; OR = 1.97; IC95%, 1.78-2.16). Concerning sleepiness during classes 43.0% of adolescents stated never feeling somnolence during classes, a percentage higher in the male gender (47.7% vs. 39.0%; $P < .001$). Diversely, 53.3% of adolescents mentioned sleepiness during classes and 3.7% indicated having fallen asleep in classes. As for daytime sleepiness, the prevalence of sleepiness during classes was superior among girls (50.1% vs. 39.8% declared “sometimes” feeling sleepy and 8.6% vs. 7.3% declared “often” feeling sleepy during classes). However, there were more boys declaring having fallen asleep in classes (5.2% vs. 2.3%). Adolescents that mentioned

experiencing difficulty getting up in the morning presented a higher risk of daytime sleepiness (OR = 7.06; IC95%, 5.84-8.53) and sleepiness during classes (OR = 5.11; IC95%, 4.22-6.18).

The alarm clock was the most widely used waking up method (49.6%) mainly by adolescent girls (56.6% vs. 41.7%; $P < .001$) and by those aged 14 to 17. Close relatives were responsible for waking up 32.8% of adolescents (essentially those aged 12 to 13) and 11.3% declared needing no help to wake up.

Discussion

Although concerns about inadequate sleep have consistently spanned the 20th century, they must be granted a greater importance nowadays. Healthy lifestyles and healthy sleep patterns are vital for a good physical, mental and intellectual development of adolescents and to prevent sleep disorders and other health problems. Several investigations have concluded that the sleep-wake cycle and sleep patterns undergo significant changes throughout adolescence. As a consequence, adolescents present irregular sleep patterns, sleep phase delay and insufficient sleep.^{5,6,19} While the number of nightly sleep hours recommend for this age group is not exactly identical for all sources, the National Sleep Foundation (2000) recommends 9h of sleep each night for adolescents¹⁶ and others recommend 9-9.5 h.^{12,13} Baring in mind these recommendations the present study disclosed that 40.4% of adolescents from the district of Viseu slept 8 to 9h per night and 29.3% slept less than 8 hours. This finding is in line with the conclusions of the less alarming investigations that only 30% of adolescents sleep at least the recommended 9 h.^{20,21} According to our results on sleep duration (self-reported) the average sleep length on weeknights is 8 h 4 min, just above the lower limit for “acceptable sleep”.^{7,16} Even though many studies on similar populations reported inferior average sleep durations on week nights,²²⁻²⁴ and others describe average sleep length only few minutes higher⁶ this is a very worrying result. Throughout adolescence sleep length decreases as age grows.^{22,23} In this particular, these Portuguese adolescents’ sleep pattern was similar to that of adolescents from other developed countries.⁷ In addition to insufficient sleep adolescents also present irregular sleep habits. The fact that only 6.4% of adolescents kept a regular bedtime corroborates the conclusions of other studies.^{5,24}

These findings on sleep patterns display an expectable association between insufficient sleep, daytime sleepiness, insomnia and symptoms of insomnia. As was the case in other investigations,^{4,25,26} besides insufficient sleep, a high proportion of adolescents presented insomnia/symptoms of insomnia and daytime sleepiness. Furthermore, daytime sleepiness, insomnia/symptoms of insomnia and insufficient sleep were more prevalent in the female sex (with statistical significance for all but insufficient sleep).

This study presents some limitations, namely the fact that data gathering was performed through a self-applied questionnaire, making it possible to suffer from memory bias. Being a transversal study it only allows to state associations. Also the characterization of adolescents’ sleep is limited to weeknights during school periods and no data was obtained on sleep patterns on weekends and holidays.

Therefore it is of the upmost importance that longitudinal studies be conducted aiming to determine the causative relations between sleep patterns, daytime sleepiness and insomnia and their influence in adolescent development.

Conclusions

These results underline the universality of sleep disorders and their consequences among adolescents, specifically insufficient sleep (increasing on older adolescents), irregular sleep patterns, insomnia and daytime sleepiness, all of which had high prevalence in our population of Portuguese adolescents. Thus, this study supports, quantifies and enlarges the findings from other investigations, chiefly international, on adolescents' sleep patterns.

It is mandatory that health and education professionals beware of the dimension of sleep disorders among adolescents so they may truly be considered a public health issue and a priority on upcoming health strategies and effective measures be taken to improve sleep hygiene and achieve healthier sleep patterns adjusted to today's adolescents and families.

What we know about the theme

Sleep disorders are increasingly prevalent among adolescents. There is growing evidence linking inadequate sleep patterns to sleep disorders, essentially insomnia. There are few investigations on sleep patterns, daytime sleepiness and insomnia among Portuguese adolescents.

What we get out the study

This study allowed for a situation diagnosis about sleep patterns, daytime sleepiness and insomnia among Portuguese adolescents and compare to similar populations. We found high prevalence of insufficient sleep, irregular sleep patterns, daytime sleepiness and insomnia. The risk was higher among girls and increased with age.

Conflicts of interest

The authors declare that there are no conflicts of interest.

References

1. National Sleep Foundation. Teens and sleep. 2009 [accessed 10-6-2014]. Available at: <http://www.sleepfoundation.org/article/sleep-topics/teens-and-sleep>.
2. Paiva T, Penzel T. Centro de medicina do sono - Manual prático. Lisboa: Lidel, edições técnicas, Lda.; 2011.
3. Roberts RE, Duong HT. Depression and insomnia among adolescents: A prospective perspective. *J Affect Disord*. 2013; 148:66-71.
4. National Institutes of Health, National Center on Sleep Disorders Research and Office of Prevention Education and Control. Working group report on problem sleepiness. 1997.
5. Hysing M, Pallesen S, Stormark KM, Lundervold AJ, Sivertsen B. Sleep patterns and insomnia among adolescents: a population-based study. *J Sleep Res*. 2013;22:549-56.
6. Short MA, Gradisar M, Lack LC, Wright HR, Dohnt H. The sleep patterns and well-being of Australian adolescents. *J Adolesc*. 2013;36:103-10.
7. Gradisar M, Gardner G, Dohnt H. Recent worldwide sleep patterns and problems during adolescence: a review and meta-analysis of age, region, and sleep. *Sleep Med*. 2011;12:110-8.
8. Knutson KL, Lauderdale DS. Sleep Duration and Overweight in Adolescents: Self-reported sleep hours versus time diaries. *Pediatrics*. 2007;119:e1056-62.
9. Matricciani LA, Olds TS, Blunden S, Rigney G, Williams MT. Never enough sleep: a brief history of sleep recommendations for children. *Pediatrics*. 2012;129:548-56.
10. Carskadon MA. Sleep in adolescents: the perfect storm. *Pediatr Clin North Am*. 2011;58:637-47.
11. Loessl B, Valerius G, Kopasz M, Hornyak M, Riemann D, Voderholzer U. Are adolescents chronically sleep-deprived? An investigation of sleep habits of adolescents in the Southwest of Germany. *Child Care Health Dev*. 2008;34:549-56.
12. Del Ciampo LA. O sono na adolescência. *Adolesc Saude*. 2012;9:60-6.
13. Foti KE, Eaton DK, Lowry R, McKnight-Ely L. Sufficient sleep, physical activity, and sedentary behaviors. *Am J Prev Med*. 2011;41:596-602.
14. Bel S, Michels N, De Vriendt T, Patterson E, Cuenca-García M, Diethelm K, et al. Association between self-reported sleep duration and dietary quality in European adolescents. *Br J Nutr*. 2013;14:1-11.
15. Yu Y, Lu BS, Wang B, Wang H, Yang J, Li Z, et al. Short sleep duration and adiposity in Chinese adolescents. *Sleep*. 2007; 30:1688-97.
16. National Sleep Foundation. Adolescent sleep needs and patterns: Research report and resource guide. 2000 [accessed 10-6-2014]. Available at: http://www.sleepinfairfax.org/docs/sleep_and_teens_report1_NSF.pdf
17. Johns MW. A New method for measuring daytime sleepiness: The Epworth Sleepiness Scale. *Sleep*. 1991;14:540-5.
18. Santos C, Ferreira PL, Moutinho J. Avaliação da sonolência diurna excessiva: adaptação cultural e linguística da Escala de Sonolência de Epworth para a população portuguesa. Porto: Escola Superior de Tecnologia da Saúde do Porto; 2001.
19. Chen MY, Wang EK, Jeng YJ. Adequate sleep among adolescents is positively associated with health status and health-related behaviors. *BMC Public Health*. 2006;6:1-8.
20. Weiss A, Xu F, Storfer-Isser A, Thomas A, Levers-Landis CE, Redline S. The association of sleep duration with adolescents' fat and carbohydrate consumption. *Sleep*. 2010;33:1201-9.
21. Bonnet MH, Arand DL. We are chronically sleep deprived. *Sleep*. 1995;18:908-11.
22. Huang YS, Wang CH, Guilleminault C. An epidemiologic study of sleep problems among adolescents in North Taiwan. *Sleep Med*. 2010;11:1035-42.
23. National Sleep Foundation. Sleep in america poll highlights and key findings 2006 [accessed 11-10-2013]. Available at: http://www.sleepfoundation.org/sites/default/files/Highlights_facts_06.pdf
24. Yilmaz K, Kiliçaslan A, Aydin N, Kul S. Understanding sleep habits and associated factors can help to improve sleep in high school adolescents. *Turk J Pediatr*. 2011;53:430-6.
25. Ohayon MM, Roberts RE, Zully, J, Smirne, S, Priest, RG. Prevalence and patterns of problematic sleep among older adolescents. *J Am Acad Child Adolesc Psychiatry*. 2000;39: 1549-56.
26. Dohnt H, Gradisar M, Short MA. Insomnia and its symptoms in adolescents: comparing DSM-IV and ICD-II diagnostic criteria. *J Clin Sleep Med*. 2012;8:295-9.